CLAIM + DETAILED DESCRIPTION

[Claim(s)]
[Claim 1]
The 1st, 2nd, and 3rd compressors (2A, 2B, 2C) formed in parallel mutually, A refrigerant circuit (1E) which has a heat source side heat exchanger (4), a heat exchanger for air conditioning for air-conditioning the interior of a room (41), a heat exchanger for cooling for cooling inside of a warehouse (45, 51), and the 1st and 2nd expansion mechanisms (42; 46, 52) that expand a refrigerant,
It has a fault detection means (80) to detect failure of said 2nd compressor (2B) at least,
It is the cooling operation performed by making said 2nd compressor (2B) and said 3rd compressor (2C) operate, Cooling operation which makes a refrigerant breathed out from said 2nd compressor (2B) and said 3rd compressor (2C) condense by said heat source side heat exchanger (4), expands it by said 1st expansion mechanism (42), evaporates it in said heat exchanger for air conditioning (41), and returns it to said 2nd compressor (2B) and said 3rd compressor (2C),
It is the refrigerating operation performed by making said 1st compressor (2A) and said 2nd compressor (2B) operate, A refrigerant breathed out from said 1st compressor (2A) and said 2nd compressor (2B) is made to condense by said heat source side heat exchanger (4), It is a refrigerating plant which can be performed freely at least about refrigerating operation which makes it expand by said 2nd expansion mechanism (46, 52), is evaporated in said heat exchanger for cooling (45, 51), and is returned to said 1st compressor (2A) and said 2nd compressor (2B),
A refrigerating plant which will continue cooling operation by making said 1st compressor (2A) operate instead of the 2nd compressor (2B) concerned if failure of said 2nd compressor (2B) is detected during said cooling operation.
[Claim 2]

The 1st, 2nd, and 3rd compressors (2A, 2B, 2C) formed in parallel mutually, A refrigerant circuit (1E) which has a heat source side heat exchanger (4), a heat exchanger for air conditioning for air-conditioning the interior of a room (41), a heat exchanger for cooling for cooling inside of a warehouse (45, 51), and the 1st and 2nd expansion mechanisms (42; 46, 52) that expand a refrigerant,
It has a fault detection means (80) to detect failure of said 2nd compressor (2B) at least,
It is the refrigerating operation performed by making said 1st compressor (2A) and said 2nd compressor (2B) operate, A refrigerant breathed out from said 1st compressor (2A) and said 2nd compressor (2B) is made to condense by said heat source side heat exchanger (4), Refrigerating operation which makes it expand by said 2nd expansion mechanism (46, 52), is evaporated in said heat exchanger for cooling (45, 51), and is returned to said 1st compressor (2A) and said 2nd compressor (2B),
It is the air conditioning refrigerating operation performed by making said 1st compressor (2A), said 2nd compressor (2B), and said 3rd compressor (2C) operate, A refrigerant breathed out from said 1st compressor (2A), said 2nd compressor (2B), and said 3rd compressor (2C) is made to condense by said heat source side heat exchanger (4), Some of condensation refrigerants concerned are decompressed even to the 1st low pressure according to said 1st expansion mechanism (42), While making it evaporate in said heat exchanger for air conditioning (41) and returning to said 3rd compressor (2C), Other condensation refrigerants are decompressed even to the 2nd low pressure lower than said 1st low pressure according to said 2nd expansion mechanism (46, 52), It is a refrigerating plant which can be performed freely at least about air conditioning refrigerating operation which is evaporated in said heat exchanger for cooling (45, 51), and is returned to said 1st compressor (2A) and said 2nd compressor (2B),
Said refrigerant circuit (1E) is further provided with refrigerant piping (23) which leads a refrigerant toward the inhalation side piping of said 3rd compressor (2C) from the inhalation side piping of said 1st compressor (2A) and said 2nd compressor (2B), and a channel opening and closing means (7a) provided in the refrigerant piping (23) concerned,
A refrigerating plant which continues refrigerating operation by making said 3rd compressor (2C) operate instead of the 2nd compressor (2B) concerned while carrying out the opening of said channel opening and closing means (7a), if failure of said 2nd compressor (2B) is detected during said refrigerating operation.
[Claim 3]
The 1st, 2nd, and 3rd compressors (2A, 2B, 2C) formed in parallel mutually, A refrigerant circuit (1E) which has a heat source side heat exchanger (4), a heat exchanger for air conditioning for air-conditioning the interior of a room (41), a heat exchanger for cooling for cooling inside of a warehouse (45, 51), and the 1st and 2nd expansion mechanisms (42; 46,

52) that expand a refrigerant,
It has a fault detection means (80) to detect failure of said 2nd compressor (2B) at least,
It is the refrigerating operation performed by making said 1st compressor (2A) and said 2nd compressor (2B) operate, A refrigerant breathed out from said 1st compressor (2A) and said 2nd compressor (2B) is made to condense by said heat source side heat exchanger (4), Refrigerating operation which makes it expand by said 2nd expansion mechanism (46, 52), is evaporated in said heat exchanger for cooling (45, 51), and is returned to said 1st compressor (2A) and said 2nd compressor (2B),
It is the air conditioning refrigerating operation performed by making said 1st compressor (2A), said 2nd compressor (2B), and said 3rd compressor (2C) operate, A refrigerant breathed out from said 1st compressor (2A), said 2nd compressor (2B), and said 3rd compressor (2C) is made to condense by said heat source side heat exchanger (4), Some of condensation refrigerants concerned are decompressed even to the 1st low pressure according to said 1st expansion mechanism (42), While making it evaporate in said heat exchanger for air conditioning (41) and returning to said 3rd compressor (2C), Other condensation refrigerants are decompressed even to the 2nd low pressure lower than said 1st low pressure according to said 2nd expansion mechanism (46, 52), It is a refrigerating plant which can be performed freely at least about air conditioning refrigerating operation which is evaporated in said heat exchanger for cooling (45, 51), and is returned to said 1st compressor (2A) and said 2nd compressor (2B),
Said refrigerant circuit (1E) is further provided with refrigerant piping (23) which leads a refrigerant toward the inhalation side piping of said 3rd compressor (2C) from the inhalation side piping of said 1st compressor (2A) and said 2nd compressor (2B), and a channel opening and closing means (7a) provided in the refrigerant piping (23) concerned,
If failure of said 2nd compressor (2B) is detected during said air conditioning refrigerating operation, Carry out the opening of said channel opening and closing means (7a), and a refrigerant breathed out from said 1st compressor (2A) and said 3rd compressor (2C) is made to condense by said heat source side heat exchanger (4), It decompresses even to specified pressure respectively lower than said 1st low pressure by said 1st expansion mechanism (42) and said 2nd expansion mechanism (46, 52), A refrigerating plant which continues air conditioning refrigerating operation by making it evaporate, respectively in said heat exchanger for air conditioning (41), and said heat exchanger for cooling (45, 51), and returning to said 1st compressor (2A) and said 3rd compressor (2C).
[Claim 4]
The 1st, 2nd, and 3rd compressors (2A, 2B, 2C) formed in parallel mutually, A refrigerant circuit (1E) which has a heat source side heat exchanger (4), a heat exchanger for air conditioning for air-conditioning the interior of a room (41), a heat exchanger for cooling for

cooling inside of a warehouse (45, 51), and the 1st and 2nd expansion mechanisms (42; 46, 52) that expand a refrigerant,
It has a fault detection means (80) to detect failure of said 3rd compressor (2C) at least,
It is the refrigerating operation performed by making said 1st compressor (2A) and said 2nd compressor (2B) operate, A refrigerant breathed out from said 1st compressor (2A) and said 2nd compressor (2B) is made to condense by said heat source side heat exchanger (4), Refrigerating operation which makes it expand by said 2nd expansion mechanism (46, 52), is evaporated in said heat exchanger for cooling (45, 51), and is returned to said 1st compressor (2A) and said 2nd compressor (2B),
It is the air conditioning refrigerating operation performed by making said 1st compressor (2A), said 2nd compressor (2B), and said 3rd compressor (2C) operate, A refrigerant breathed out from said 1st compressor (2A), said 2nd compressor (2B), and said 3rd compressor (2C) is made to condense by said heat source side heat exchanger (4), Some of condensation refrigerants concerned are decompressed even to the 1st low pressure according to said 1st expansion mechanism (42), While making it evaporate in said heat exchanger for air conditioning (41) and returning to said 3rd compressor (2C), Other condensation refrigerants are decompressed even to the 2nd low pressure lower than said 1st low pressure according to said 2nd expansion mechanism (46, 52), It is a refrigerating plant which can be performed freely at least about air conditioning refrigerating operation which is evaporated in said heat exchanger for cooling (45, 51), and is returned to said 1st compressor (2A) and said 2nd compressor (2B),
Said refrigerant circuit (1E) is further provided with refrigerant piping (24) which leads a refrigerant toward the inhalation side piping of said 1st compressor (2A) and said 2nd compressor (2B) from the inhalation side piping of said 3rd compressor (2C), and a channel opening and closing means (7b) provided in the refrigerant piping (24) concerned,
If failure of said 3rd compressor (2C) is detected during said air conditioning refrigerating operation, Carry out the opening of said channel opening and closing means (7b), and a refrigerant breathed out from said 1st compressor (2A) and said 2nd compressor (2B) is made to condense by said heat source side heat exchanger (4), It decompresses even to specified pressure respectively lower than said 1st low pressure by said 1st expansion mechanism (42) and said 2nd expansion mechanism (46, 52), A refrigerating plant which continues air conditioning refrigerating operation by making it evaporate, respectively in said heat exchanger for air conditioning (41), and said heat exchanger for cooling (45, 51), and returning to said 1st compressor (2A) and said 2nd compressor (2B).
[Claim 5]
The 1st, 2nd, and 3rd compressors (2A, 2B, 2C) formed in parallel mutually, A refrigerant circuit (1E) which has a heat source side heat exchanger (4), a heat exchanger for air

conditioning for air-conditioning the interior of a room (41), a heat exchanger for cooling for cooling inside of a warehouse (45, 51), and the 1st and 2nd expansion mechanisms (26; 46, 52) that expand a refrigerant,
It has a fault detection means (80) to detect failure of said 2nd compressor (2B) at least,
It is the heating operation performed by making said 2nd compressor (2B) and said 3rd compressor (2C) operate, Heating operation which makes a refrigerant breathed out from said 2nd compressor (2B) and said 3rd compressor (2C) condense by said heat exchanger for air conditioning (41), expands it by said 1st expansion mechanism (26), evaporates it in said heat source side heat exchanger (4), and returns it to said 2nd compressor (2B) and said 3rd compressor (2C),
It is the refrigerating operation performed by making said 1st compressor (2A) and said 2nd compressor (2B) operate, A refrigerant breathed out from said 1st compressor (2A) and said 2nd compressor (2B) is made to condense by said heat source side heat exchanger (4), It is a refrigerating plant which can be performed freely at least about refrigerating operation which makes it expand by said 2nd expansion mechanism (46, 52), is evaporated in said heat exchanger for cooling (45, 51), and is returned to said 1st compressor (2A) and said 2nd compressor (2B),
A refrigerating plant which will continue heating operation by making said 1st compressor (2A) operate instead of the 2nd compressor (2B) concerned if failure of said 2nd compressor (2B) is detected during said heating operation.
[Claim 6]
The 1st, 2nd, and 3rd compressors (2A, 2B, 2C) formed in parallel mutually, A refrigerant circuit (1E) which has a heat source side heat exchanger (4), a heat exchanger for air conditioning for air-conditioning the interior of a room (41), a heat exchanger for cooling for cooling inside of a warehouse (45, 51), and the 1st and 2nd expansion mechanisms (42; 46, 52) that expand a refrigerant,
It has a fault detection means (80) to detect failure of said 2nd compressor (2B) at least,
It is the heating operation performed by making said 2nd compressor (2B) and said 3rd compressor (2C) operate, Heating operation which makes a refrigerant breathed out from said 2nd compressor (2B) and said 3rd compressor (2C) condense by said heat exchanger for air conditioning (41), expands it by said 1st expansion mechanism (42), evaporates it in said heat source side heat exchanger (4), and returns it to said 2nd compressor (2B) and said 3rd compressor (2C),
It is the heating refrigerating operation performed by making said 1st compressor (2A) and said 2nd compressor (2B) operate, While making some refrigerants breathed out from said 1st compressor (2A) and said 2nd compressor (2B) condense by said heat exchanger for air conditioning (41), Make other discharged refrigerants condense by said heat source side heat

exchanger (4), and both the refrigerants concerned are expanded by said 2nd expansion mechanism (46, 52), It is a refrigerating plant which can be performed freely at least about heating refrigerating operation which is evaporated in said heat exchanger for cooling (45, 51), and is returned to said 1st compressor (2A) and said 2nd compressor (2B),
Said refrigerant circuit (1E) is further provided with refrigerant piping (23) which leads a refrigerant toward the inhalation side piping of said 3rd compressor (2C) from the inhalation side piping of said 1st compressor (2A) and said 2nd compressor (2B), and a channel opening and closing means (7a) provided in the refrigerant piping (23) concerned,
A refrigerating plant which continues heating refrigerating operation by making said 3rd compressor (2C) operate instead of the 2nd compressor (2B) concerned while carrying out the opening of said channel opening and closing means (7a), if failure of said 2nd compressor (2B) is detected during said heating refrigerating operation.
[Claim 7]
It is a refrigerating plant of any one description of the Claims 1-6,
A heat exchanger for cooling is provided with a heat exchanger for cold storage (45), and a heat exchanger for freezing (51),
A refrigerating plant provided with an auxiliary compressor (53) which a refrigerant circuit (1E) is established in the lower stream side of said heat exchanger for freezing (51), and makes refrigerant pressure in the heat exchanger for freezing concerned (51) lower than refrigerant pressure in said heat exchanger for cold storage (45).
[Claim 8]
It is the refrigerating plant according to claim 7,
A refrigerating plant provided with a bypass channel (59) which pours a refrigerant so that one end may be connected to a discharge side of an auxiliary compressor (53), and the other end may be connected to the auxiliary compressor (53) inhalation-side and said auxiliary compressor (53) may be bypassed at the time of failure of said auxiliary compressor (53).

[Detailed Description of the Invention]
Technical field
Especially this invention relates to the refrigerating plant provided with the heat exchanger for air conditioning, and the heat exchanger for cooling about a refrigerating plant.
Background art
Conventionally, the refrigerating plant is widely used as coolers, such as an air conditioner which carries out the air conditioning of the interior of a room, and cold storage which stores foodstuffs etc. Some refrigerating plants perform both air conditioning and cold storage as indicated by WO98/45651. This kind of refrigerating plant was installed in the place where the

both sides of air conditioning and cold storage are demanded, for example, a convenience store etc., and is provided with two or more sets of compressors, and the use side heat exchanger of plurality, such as a heat exchanger for air conditioning, and a heat exchanger for cold storage. Therefore, air conditioning of inside of a shop and cooling of a showcase etc. can be performed by one set of a refrigerating plant by using this kind of refrigerating plant.
By the way, in the conventional refrigerating plant, failure of any 1 compressor looked at the tendency for the capability of either one of the heat exchanger for air conditioning or the heat exchanger for cold storage to decline, or for the capability of both heat exchangers to decline on the whole.
However, even if one set of a compressor breaks down, a refrigerating plant which can continue operation as it is is desired, without causing excessive ability degradation.
It is more important to maintain the capability of cold storage rather than the both sides of air conditioning and cold storage generally maintain the capability of air conditioning for the use demanded. Although the fall of air conditioning capacity just needs to cause a resident's displeasure, it is because the fall of cold storage capability causes the quality fall of cooling object things (for example, frozen food etc.). however, when failure occurs in a compressor, the conventional refrigerating plant changes the contents of operation so that cold storage capability may be secured -- as -- it was not constituted. Then, even if one set of a compressor breaks down, a refrigerating plant which can continue operation is desired, securing cold storage capability.
This invention is made in view of this point, and there is a place made into the purpose in providing the refrigerating plant which can continue operation as it is, even if one set of a compressor breaks down.
The indication of an invention
The 1st, 2nd, and 3rd compressors with which the 1st refrigerating plant of each other was formed in parallel, A heat source side heat exchanger, the heat exchanger for air conditioning for air-conditioning the interior of a room, and the heat exchanger for cooling for cooling the inside of a warehouse, It has a refrigerant circuit which has the 1st and 2nd expansion mechanisms that expand a refrigerant, and a fault detection means to detect failure of said 2nd compressor at least, It is the cooling operation performed by making said 2nd compressor and said 3rd compressor operate, The cooling operation which makes the refrigerant breathed out from said 2nd compressor and said 3rd compressor condense by said heat source side heat exchanger, expands it by said 1st expansion mechanism, evaporates it in said heat exchanger for air conditioning, and returns it to said 2nd compressor and said 3rd compressor, It is the refrigerating operation performed by making said 1st compressor and said 2nd compressor operate, The refrigerant breathed out from said 1st compressor and said 2nd compressor is made to condense by said heat source side heat exchanger, If it is a refrigerating plant which

can be performed freely at least about the refrigerating operation which makes it expand by said 2nd expansion mechanism, is evaporated in said heat exchanger for cooling, and is returned to said 1st compressor and said 2nd compressor and failure of said 2nd compressor is detected during said cooling operation, Cooling operation is continued by making said 1st compressor operate instead of the 2nd compressor concerned.
The 1st, 2nd, and 3rd compressors with which the 2nd refrigerating plant of each other was formed in parallel, A heat source side heat exchanger, the heat exchanger for air conditioning for air-conditioning the interior of a room, and the heat exchanger for cooling for cooling the inside of a warehouse, It has a refrigerant circuit which has the 1st and 2nd expansion mechanisms that expand a refrigerant, and a fault detection means to detect failure of said 2nd compressor at least, It is the refrigerating operation performed by making said 1st compressor and said 2nd compressor operate, The refrigerating operation which makes the refrigerant breathed out from said 1st compressor and said 2nd compressor condense by said heat source side heat exchanger, expands it by said 2nd expansion mechanism, evaporates it in said heat exchanger for cooling, and returns it to said 1st compressor and said 2nd compressor, It is the air conditioning refrigerating operation performed by making said 1st compressor, said 2nd compressor, and said 3rd compressor operate, Make the refrigerant breathed out from said 1st compressor, said 2nd compressor, and said 3rd compressor condense by said heat source side heat exchanger, decompress some of condensation refrigerants concerned even to the 1st low pressure according to said 1st expansion mechanism, and it is made to evaporate in said heat exchanger for air conditioning, and returns to said 3rd compressor.
On the other hand, other condensation refrigerants are decompressed even to the 2nd low pressure lower than said 1st low pressure according to said 2nd expansion mechanism, At least, are the air conditioning refrigerating operation which is evaporated in said heat exchanger for cooling, and is returned to said 1st compressor and said 2nd compressor a refrigerating plant which can be performed freely, and, [said refrigerant circuit] The refrigerant piping which leads a refrigerant toward the inhalation side piping of said 3rd compressor from the inhalation side piping of said 1st compressor and said 2nd compressor, If it has further the channel opening and closing means provided in the refrigerant piping concerned and failure of said 2nd compressor is detected during said refrigerating operation, while carrying out the opening of said channel opening and closing means, refrigerating operation is continued by making said 3rd compressor operate instead of the 2nd compressor concerned.

The 1st, 2nd, and 3rd compressors with which the 3rd refrigerating plant of each other was formed in parallel, A heat source side heat exchanger, the heat exchanger for air conditioning for air-conditioning the interior of a room, and the heat exchanger for cooling for cooling the

inside of a warehouse, It has a refrigerant circuit which has the 1st and 2nd expansion mechanisms that expand a refrigerant, and a fault detection means to detect failure of said 2nd compressor at least, It is the refrigerating operation performed by making said 1st compressor and said 2nd compressor operate, The refrigerating operation which makes the refrigerant breathed out from said 1st compressor and said 2nd compressor condense by said heat source side heat exchanger, expands it by said 2nd expansion mechanism, evaporates it in said heat exchanger for cooling, and returns it to said 1st compressor and said 2nd compressor, It is the air conditioning refrigerating operation performed by making said 1st compressor, said 2nd compressor, and said 3rd compressor operate, Make the refrigerant breathed out from said 1st compressor, said 2nd compressor, and said 3rd compressor condense by said heat source side heat exchanger, decompress some of condensation refrigerants concerned even to the 1st low pressure according to said 1st expansion mechanism, and it is made to evaporate in said heat exchanger for air conditioning, and returns to said 3rd compressor.
On the other hand, other condensation refrigerants are decompressed even to the 2nd low pressure lower than said 1st low pressure according to said 2nd expansion mechanism, At least, are the air conditioning refrigerating operation which is evaporated in said heat exchanger for cooling, and is returned to said 1st compressor and said 2nd compressor a refrigerating plant which can be performed freely, and, [said refrigerant circuit] The refrigerant piping which leads a refrigerant toward the inhalation side piping of said 3rd compressor from the inhalation side piping of said 1st compressor and said 2nd compressor, If it has further the channel opening and closing means provided in the refrigerant piping concerned and failure of said 2nd compressor is detected during said air conditioning refrigerating operation, Carry out the opening of said channel opening and closing means, and the refrigerant breathed out from said 1st compressor and said 3rd compressor is made to condense by said heat source side heat exchanger, Air conditioning refrigerating operation is continued by decompressing even to specified pressure respectively lower than said 1st low pressure by said 1st expansion mechanism and said 2nd expansion mechanism, making it evaporate, respectively in said heat exchanger for air conditioning, and said heat exchanger for cooling, and returning to said 1st compressor and said 3rd compressor.

The 1st, 2nd, and 3rd compressors with which the 4th refrigerating plant of each other was formed in parallel, A heat source side heat exchanger, the heat exchanger for air conditioning for air-conditioning the interior of a room, and the heat exchanger for cooling for cooling the inside of a warehouse, It has a refrigerant circuit which has the 1st and 2nd expansion mechanisms that expand a refrigerant, and a fault detection means to detect failure of said 3rd compressor at least, It is the refrigerating operation performed by making said 1st compressor

and said 2nd compressor operate, The refrigerating operation which makes the refrigerant breathed out from said 1st compressor and said 2nd compressor condense by said heat source side heat exchanger, expands it by said 2nd expansion mechanism, evaporates it in said heat exchanger for cooling, and returns it to said 1st compressor and said 2nd compressor, It is the air conditioning refrigerating operation performed by making said 1st compressor, said 2nd compressor, and said 3rd compressor operate, Make the refrigerant breathed out from said 1st compressor, said 2nd compressor, and said 3rd compressor condense by said heat source side heat exchanger, decompress some of condensation refrigerants concerned even to the 1st low pressure according to said 1st expansion mechanism, and it is made to evaporate in said heat exchanger for air conditioning, and returns to said 3rd compressor.
On the other hand, other condensation refrigerants are decompressed even to the 2nd low pressure lower than said 1st low pressure according to said 2nd expansion mechanism, At least, are the air conditioning refrigerating operation which is evaporated in said heat exchanger for cooling, and is returned to said 1st compressor and said 2nd compressor a refrigerating plant which can be performed freely, and, [said refrigerant circuit] The refrigerant piping which leads a refrigerant toward the inhalation side piping of said 1st compressor and said 2nd compressor from the inhalation side piping of said 3rd compressor, If it has further the channel opening and closing means provided in the refrigerant piping concerned and failure of said 3rd compressor is detected during said air conditioning refrigerating operation, Carry out the opening of said channel opening and closing means, and the refrigerant breathed out from said 1st compressor and said 2nd compressor is made to condense by said heat source side heat exchanger, Air conditioning refrigerating operation is continued by decompressing even to specified pressure respectively lower than said 1st low pressure by said 1st expansion mechanism and said 2nd expansion mechanism, making it evaporate, respectively in said heat exchanger for air conditioning, and said heat exchanger for cooling, and returning to said 1st compressor and said 2nd compressor.

The 1st, 2nd, and 3rd compressors with which the 5th refrigerating plant of each other was formed in parallel, A heat source side heat exchanger, the heat exchanger for air conditioning for air-conditioning the interior of a room, and the heat exchanger for cooling for cooling the inside of a warehouse, It has a refrigerant circuit which has the 1st and 2nd expansion mechanisms that expand a refrigerant, and a fault detection means to detect failure of said 2nd compressor at least, It is the heating operation performed by making said 2nd compressor and said 3rd compressor operate, The heating operation which makes the refrigerant breathed out from said 2nd compressor and said 3rd compressor condense by said heat exchanger for air conditioning, expands it by said 1st expansion mechanism, evaporates it in said heat source

side heat exchanger, and returns it to said 2nd compressor and said 3rd compressor, It is the refrigerating operation performed by making said 1st compressor and said 2nd compressor operate, The refrigerant breathed out from said 1st compressor and said 2nd compressor is made to condense by said heat source side heat exchanger, If it is a refrigerating plant which can be performed freely at least about the refrigerating operation which makes it expand by said 2nd expansion mechanism, is evaporated in said heat exchanger for cooling, and is returned to said 1st compressor and said 2nd compressor and failure of said 2nd compressor is detected during said heating operation, Heating operation is continued by making said 1st compressor operate instead of the 2nd compressor concerned.
The 1st, 2nd, and 3rd compressors with which the 6th refrigerating plant of each other was formed in parallel, A heat source side heat exchanger, the heat exchanger for air conditioning for air-conditioning the interior of a room, and the heat exchanger for cooling for cooling the inside of a warehouse, It has a refrigerant circuit which has the 1st and 2nd expansion mechanisms that expand a refrigerant, and a fault detection means to detect failure of said 2nd compressor at least, It is the heating operation performed by making said 2nd compressor and said 3rd compressor operate, The heating operation which makes the refrigerant breathed out from said 2nd compressor and said 3rd compressor condense by said heat exchanger for air conditioning, expands it by said 1st expansion mechanism, evaporates it in said heat source side heat exchanger, and returns it to said 2nd compressor and said 3rd compressor, It is the heating refrigerating operation performed by making said 1st compressor and said 2nd compressor operate, and some refrigerants breathed out from said 1st compressor and said 2nd compressor are made to condense by said heat exchanger for air conditioning.
On the other hand, make other discharged refrigerants condense by said heat source side heat exchanger, and both the refrigerants concerned are expanded by said 2nd expansion mechanism, At least, are the heating refrigerating operation which is evaporated in said heat exchanger for cooling, and is returned to said 1st compressor and said 2nd compressor a refrigerating plant which can be performed freely, and, [said refrigerant circuit] The refrigerant piping which leads a refrigerant toward the inhalation side piping of said 3rd compressor from the inhalation side piping of said 1st compressor and said 2nd compressor, If it has further the channel opening and closing means provided in the refrigerant piping concerned and failure of said 2nd compressor is detected during said heating refrigerating operation, while carrying out the opening of said channel opening and closing means, heating refrigerating operation is continued by making said 3rd compressor operate instead of the 2nd compressor concerned.

In said 1st [the] - the 6th refrigerating plant, the 7th refrigerating plant, [the heat exchanger for cooling] It had the heat exchanger for cold storage, and the heat exchanger for freezing, and the refrigerant circuit was established in the lower stream side of said heat exchanger for

freezing, and is provided with the auxiliary compressor which makes refrigerant pressure in the heat exchanger for freezing concerned lower than the refrigerant pressure in said heat exchanger for cold storage.

As for the 8th refrigerating plant, in the 7th refrigerating plant, one end is connected to the discharge side of an auxiliary compressor (53), and the other end is connected to the auxiliary compressor (53) inhalation-side, It has the bypass channel (59) which pours a refrigerant so that said auxiliary compressor (53) may be bypassed at the time of failure of said auxiliary compressor (53).

In the 1st refrigerating plant, if the 2nd compressor breaks down during cooling operation instead, the 1st compressor will drive. And the refrigerant breathed out from the 1st compressor and the 3rd compressor is condensed by a heat source side heat exchanger, and expands by the 1st expansion mechanism, it evaporates in the heat exchanger for air conditioning, and circulating movement which returns to the 1st compressor and the 3rd compressor is performed. Thereby, cooling operation is continuable, maintaining cooling capacity.

In the 2nd refrigerating plant, if the 2nd compressor breaks down during refrigerating operation, a channel opening and closing means will carry out an opening, and the 3rd compressor will drive. And the refrigerant breathed out from the 1st compressor and the 3rd compressor is condensed by a heat source side heat exchanger, and expands by the 2nd expansion mechanism, it evaporates in the heat exchanger for cooling, and circulating movement which returns to the 1st compressor and the 3rd compressor is performed. Thereby, refrigerating operation is continuable, maintaining refrigerating capacity.

In the 3rd refrigerating plant, if the 2nd compressor breaks down during air conditioning refrigerating operation, a channel opening and closing means will carry out an opening. And the refrigerant breathed out from the 1st compressor and the 3rd compressor is condensed by a heat source side heat exchanger, and is decompressed by the 1st expansion mechanism and the 2nd expansion mechanism, respectively, it evaporates, respectively in the heat exchanger for air conditioning, and the heat exchanger for cooling, and circulating movement which returns to the 1st compressor and the 3rd compressor is performed. Thereby, the circulating volume of refrigerant of the heat exchanger for cooling is maintained. On the other hand, the circulating volume of refrigerant of the heat exchanger for air conditioning decreases. However, since the refrigerant pressure of the heat exchanger for air conditioning declines, the evaporating temperature of the refrigerant in the heat exchanger for air conditioning falls. Therefore, although circulating volume of refrigerant decreases, the fall of the cooling capacity of the heat exchanger for air conditioning is controlled. Thus, air conditioning refrigerating operation is continuable, maintaining refrigerating capacity at least.

If the 3rd compressor breaks down during air conditioning refrigerating operation, [the 4th

refrigerating plant] [the refrigerant which the channel opening and closing means carried out the opening and was breathed out from the 1st compressor and the 2nd compressor] It condenses by a heat source side heat exchanger, is decompressed by the 1st expansion mechanism and the 2nd expansion mechanism, respectively, and evaporates, respectively in the heat exchanger for air conditioning, and the heat exchanger for cooling, and circulating movement which returns to the 1st compressor and the 2nd compressor is performed. By this, air conditioning refrigerating operation is continuable like the 3rd refrigerating plant of the above, maintaining refrigerating capacity at least.
In the 5th refrigerating plant, if the 2nd compressor breaks down during heating operation instead, the 1st compressor will drive. And the refrigerant breathed out from the 1st compressor and the 3rd compressor is condensed by the heat exchanger for air conditioning, and expands by the 1st expansion mechanism, it evaporates in a heat source side heat exchanger, and circulating movement which returns to the 1st compressor and the 3rd compressor is performed. Thereby, heating operation is continuable, maintaining heating capacity.
In the 6th refrigerating plant, if the 2nd compressor breaks down during heating refrigerating operation, a channel opening and closing means will carry out an opening, and the 3rd compressor will drive. And while condensing some refrigerants breathed out from the 1st compressor and the 3rd compressor by the heat exchanger for air conditioning, other discharged refrigerants are condensed by a heat source side heat exchanger, both refrigerants expand by the 2nd expansion mechanism further, it evaporates in the heat exchanger for cooling, and circulating movement which returns to the 1st compressor and the 3rd compressor is performed. Thereby, heating refrigerating operation is continuable, maintaining refrigerating capacity at least.
In the 7th refrigerating plant, the heat exchanger for cooling is provided with two kinds of heat exchangers (the heat exchanger for cold storage, and the heat exchanger for freezing) from which evaporating temperature differs, and a cooling object thing can be cooled with two kinds of cooling temperature.
In the 8th refrigerating plant, since a refrigerant bypasses an auxiliary compressor through a bypass channel when an auxiliary compressor breaks down, facilitation of refrigerant circulation can be attained.
As mentioned above, according to this invention, even if one set of a compressor breaks down, predetermined operation can be continued, without being accompanied by big ability degradation. Therefore, the reliability of a device can be raised.
Since the above-mentioned operation can be continued without reducing the cooling capacity of the heat exchanger for cooling when a compressor breaks down during operation (refrigerating operation, air conditioning refrigerating operation, or heating refrigerating

operation) which cools the inside of a warehouse by the heat exchanger for cooling especially, the quality fall of a cooling object thing, etc. can be prevented.

The best form for inventing

Hereafter, an embodiment of the invention is described based on Drawings.

- Entire configuration of a refrigerating plant -

As shown in drawing 1, the refrigerating plant (1) concerning an embodiment is for performing cooling of the showcase which is the refrigerating plant installed in the convenience store, and is in a warehouse, and the air conditioning of the inside of a shop which is the interior of a room.

The refrigerating plant (1) had an outdoor unit (1A), an indoor unit (1B), a cold storage unit (1C), and a refrigerating and heating unit (1D), and is provided with the refrigerant circuit (1E) which performs a compression refrigeration cycle.

An indoor unit (1B) is constituted so that cooling operation and heating operation may be performed selectively, for example, it is installed in a counter etc. The cold storage unit (1C) is installed in the showcase for cold storage.

Air in a warehouse of the showcase concerned is cooled.

The refrigerating and heating unit (1D) is installed in the showcase for freezing.

Air in a warehouse of the showcase concerned is cooled.

- Outdoor unit

An outdoor unit (1A) is provided with a non inverter compressor (2A), the 1st inverter compressor (2B), and the 2nd inverter compressor (2C), and it is provided with the 1st four way directional control valve (3A) and the 2nd four way directional control valve (3B), and the outdoor heat exchanger (4) that is heat source side heat exchangers.

Each above-mentioned compressor (2A, 2B, 2C) comprises a high voltage dome shape scroll compressor of the encapsulated type, for example. A non inverter compressor (2A) is a thing of the constant capacity type which an electric motor always drives with the number of certain rotations. The 1st inverter compressor (2B) and the 2nd inverter compressor (2C) are compressors which inverter control of the electric motor is carried out, and can be changed [gradual / capacity / or] continuously.

A non inverter compressor (2A), the 1st inverter compressor (2B), and the 2nd inverter compressor (2C) constitute two compressor styles (2D), i.e., the compressor style of the 1st line, and the compressor style (2E) of the 2nd line. The antenna radiation pattern of the compressor which constitutes these two compressor styles (2D, 2E) is changed suitably. That is, when a non inverter compressor (2A) and the 1st inverter compressor (2B) constitute the compressor style (2D) of the 1st line and the 2nd inverter compressor (2C) constitutes the compressor style (2E) of the 2nd line, A non inverter compressor (2A) may constitute the

compressor style (2D) of the 1st line, and the 1st inverter compressor (2B) and the 2nd inverter compressor (2C) may constitute the compressor style (2E) of the 2nd line.
Each discharge pipe (5a, 5b, 5c) of a non inverter compressor (2A), the 1st inverter compressor (2B), and the 2nd inverter compressor (2C) is connected to one high pressure gas pipe (8), and the high pressure gas pipe (8) is connected to the 1st port of the 1st four way directional control valve (3A). The check valve (7) is provided in the discharge pipe (5a) of a non inverter compressor (2A), the discharge pipe (5b) of the 1st inverter compressor (2B), and the discharge pipe (5c) of the 2nd inverter compressor (2C), respectively so that it can start from every compressor.
The gas side edge part of the outdoor heat exchanger (4) is connected to the 2nd port of the 1st four way directional control valve (3A) by the outdoor gas pipe (9). The end of the liquid tube (10) which is a liquid line is connected to the liquid side edge part of an outdoor heat exchanger (4). The receiver (14) is formed in the middle of the liquid tube (10), and the other end of a liquid tube (10) has branched to the 1st connection liquid tube (11) and the 2nd connection liquid tube (12).
The kind in particular of outdoor heat exchanger (4) is not limited, and can use conveniently the fin and tube type heat exchanger of a cross fin type, etc., for example. The outdoor fan (4F) is arranged near the outdoor heat exchanger (4).
Each induction pipe (6a, 6b) of a non inverter compressor (2A) and the 1st inverter compressor (2B) is connected to the low pressure gas pipe (15). The induction pipe (6c) of the 2nd inverter compressor (2C) is connected to the 3rd port of the 2nd four way directional control valve (3B).

The connection gas pipe (17) is connected to the 4th port of the 1st four way directional control valve (3A). The 3rd port of the 1st four way directional control valve (3A) is connected to the 4th port of the 2nd four way directional control valve (3B) by the connecting pipe (18). The 1st port of the 2nd four way directional control valve (3B) is connected to the discharge pipe (5c) of the 2nd inverter compressor (2C) by the auxiliary gas pipe (19). The 2nd port of the 2nd four way directional control valve (3B) is the closing port always blockaded. That is, the 2nd four way directional control valve (3B) is a channel selector which connects three ports suitably. Therefore, it is also possible to use a 3 way change-over valve instead of the 2nd four way directional control valve (3B).
The 1st state (refer to drawing 1 continuous line) where a high pressure gas pipe (8) and an outdoor gas pipe (9) open the 1st four way directional control valve (3A) for free passage, and a connecting pipe (18) and a connection gas pipe (17) are open for free passage, It is constituted so that it may switch to the 2nd state (refer to drawing 1 broken line) where a high pressure gas pipe (8) and a connection gas pipe (17) are open for free passage, and a connecting pipe (18) and an outdoor gas pipe (9) are open for free passage.

The 1st state (refer to drawing 1 continuous line) where an auxiliary gas pipe (19) and a closing port open the 2nd four way directional control valve (3B) for free passage, and a connecting pipe (18) and the induction pipe (6c) of the 2nd inverter compressor (2C) are open for free passage, It is constituted so that it may switch to the 2nd state (refer to drawing 1 broken line) where an auxiliary gas pipe (19) and a connecting pipe (18) are open for free passage, and an induction pipe (6c) and a blockade port are open for free passage.

Each above-mentioned discharge pipe (5a, 5b, 5c), the high pressure gas pipe (8), and the outdoor gas pipe (9) constitute the high voltage gas lines at the time of cooling operation (1L). On the other hand, a low pressure gas pipe (15) and each induction pipe (6a, 6b) of the compressor style (2D) of the 1st line constitute the 1st low voltage gas lines (1M). The connection gas pipe (17) and the induction pipe (6c) of the compressor style (2E) of the 2nd line constitute the 2nd low voltage gas lines at the time of cooling operation (1N).

The 1st connection liquid tube (11), the 2nd connection liquid tube (12), a connection gas pipe (17), and a low pressure gas pipe (15) are extended outside from an outdoor unit (1A), and the closing valve (20) is provided in the outdoor unit (1A), respectively. A check valve (7) is provided in an outdoor unit (1A), and the branching side edge part of the 2nd connection liquid tube (12) is constituted so that a refrigerant may flow toward a closing valve (20) from a receiver (14).

Between the low pressure gas pipe (15) and the induction pipe (6c) of the 2nd inverter compressor (2C), the communicating vessel (21) which is an auxiliary line is connected. The communicating vessel (21) is enabling the free passage of the inhalation-with non inverter compressor (2A), 1st inverter compressor (2B), and 2nd inverter compressor (2C) side mutually. the [in which the communicating vessel (21) branched from the main pipe (22) and the main pipe (22)] -- the [1 secondary pipe (23) and] -- it has 2 secondary pipes (24). And the main pipe (22) is connected to the induction pipe (6c) of the 2nd inverter compressor (2C). the -- the [1 secondary pipe (23) and] -- 2 secondary pipes (24) are connected to the low pressure gas pipe (15).

the -- the [1 secondary pipe (23) and] -- the solenoid controlled valve (7a, 7b) and check valve (7) which are opening-and-closing mechanisms are provided in 2 secondary pipes (24), respectively. the [that is,] -- 1 secondary pipe (23) is constituted so that a refrigerant may be circulated toward the inhalation side piping of the 2nd inverter compressor (2C) from the inhalation side piping of a non inverter compressor (2A) and the 1st inverter compressor (2B). the -- 2 secondary pipes (24) are constituted so that a refrigerant may be circulated toward the inhalation side piping of a non inverter compressor (2A) and the 1st inverter compressor (2B) from the inhalation side piping of the 2nd inverter compressor (2C).

The auxiliary liquid pipe (25) which bypasses a receiver (14) is connected to the liquid tube (10). With the auxiliary liquid pipe (25), a refrigerant mainly flows into a heating period and the

outdoor expansion valve (26) which is an expansion mechanism is provided in this auxiliary liquid pipe (25). Between the outdoor heat exchanger (4) and receiver (14) in a liquid tube (10), the check valve (7) which permits only the refrigerant flow which faces to a receiver (14) is provided. The check valve (7) is located between the terminal area of the auxiliary liquid pipe (25) in a liquid tube (10), and a receiver (14).

The liquid injection tube (27) is connected between the auxiliary liquid pipe (25) and the low pressure gas pipe (15). The solenoid controlled valve (7c) is provided in the liquid injection tube (27). The degassing pipe (28) is connected between a receiver's (14)'s upper part, and the discharge pipe (5a) of a non inverter compressor (2A). The check valve (7) which permits only the refrigerant flow which faces to a discharge pipe (5a) from a receiver (14) is provided in the degassing pipe (28).

The oil separator (30) is provided in the high pressure gas pipe (8). The end of the oil return pipe (31) is connected to the oil separator (30). A solenoid controlled valve (7d) is provided in an oil return pipe (31), and the other end of the oil return pipe (31) is connected to the induction pipe (6a) of a non inverter compressor (2A). The 1st oil equalization tube (32) is connected between the dome of a non inverter compressor (2A), and the induction pipe (6c) of the 2nd inverter compressor (2C). The check valve (7) and solenoid controlled valve (7e) which permit the oil flow which faces to the 2nd inverter compressor (2C) from a non inverter compressor (2A) are provided in the 1st oil equalization tube (32).

The end of the 2nd oil equalization tube (33) is connected to the dome of the 1st inverter compressor (2B). The other end of the 2nd oil equalization tube (33) is connected between the check valve (7) of the 1st oil equalization tube (32), and the solenoid controlled valve (7e). The 3rd oil equalization tube (34) is connected with the dome of the 2nd inverter compressor (2C) between low pressure gas pipes (15). The solenoid controlled valve (7f) is provided in the 3rd oil equalization tube (34).

The floor-heating circuit (35) is connected to the liquid tube (10). The floor-heating circuit (35) is provided with a floor-heating heat exchanger (36), the 1st piping (37), and the 2nd piping (38). One end of the 1st piping (37) is connected between the check valve (7) and closing valve (20) in the 1st connection liquid tube (11), and the other end is connected to the floor-heating heat exchanger (36). One end of the 2nd piping (38) is connected between the check valve (7) and receiver (14) in a liquid tube (10), and the other end is connected to the floor-heating heat exchanger (36). The floor-heating heat exchanger (36) is arranged at the convenience store at the register (money payment place) which is a place where a salesclerk works for a long time.

A closing valve (20) is provided in the 1st piping (37) and the 2nd piping (38), and the check valve (7) which permits only the refrigerant flow which goes to a floor-heating heat exchanger (36) is provided in the 1st piping (37). A floor-heating heat exchanger (36) can also be

reduced, and when not providing a floor-heating heat exchanger (36), the 1st piping (37) and the 2nd piping (38) are connected directly.

- Indoor unit

The indoor unit (1B) is provided with the indoor expansion valve (42) which is the indoor heat exchanger (41) and the expansion mechanism which are the use side heat exchangers. The connection gas pipe (17) is connected to the gas side of indoor heat exchanger (41). On the other hand, the 2nd connection liquid tube (12) is connected to the liquid side of indoor heat exchanger (41) via the indoor expansion valve (42). The kind in particular of indoor heat exchanger (41) is not limited, and can use conveniently the fin and tube type heat exchanger of a cross fin type, for example. Near the indoor heat exchanger (41), the indoor fan (43) which is the use side fan is arranged.

- Cold storage unit

The cold storage unit (1C) is provided with the cold storage expansion valve (46) which is the cold storage heat exchanger (45) and expansion mechanism which are heat-of-cooling switchboards. The 1st connection liquid tube (11) is connected to the liquid side of a cold storage heat exchanger (45) via the solenoid controlled valve (7g) and the cold storage expansion valve (46). On the other hand, the low pressure gas pipe (15) is connected to the gas side of a cold storage heat exchanger (45).

A cold storage heat exchanger (45) is open for free passage to the compressor style's (2D's) suction side of the 1st line.

On the other hand, indoor heat exchanger (41) is open for free passage to the 2nd inverter compressor's (2C's) suction side at the time of cooling operation.

Therefore, the refrigerant pressure (evaporating pressure) of a cold storage heat exchanger (45) usually becomes lower than the refrigerant pressure (evaporating pressure) of indoor heat exchanger (41). As a result, the refrigerant evaporation temperature of a cold storage heat exchanger (45) will be -10 **, for example, and the refrigerant evaporation temperature of indoor heat exchanger (41) will be +5 **, for example. Thus, the refrigerant circuit (1E) constitutes the so-called circuit of different temperature evaporation.

A cold storage expansion valve (46) is a thermal-sensing type expansion valve, and the temperature sensor barrel is attached to the gas side of a cold storage heat exchanger (45). The fin and tube type heat exchanger of a cross fin type can be conveniently used for a cold storage heat exchanger (45), for example. Near the cold storage heat exchanger (45), the refrigeration fan (47) which is a cooling fan is arranged.

- Refrigerating and heating unit

The refrigerating and heating unit (1D) is provided with the frozen heat exchanger (51) which is a heat-of-cooling switchboard, the frozen expansion valve (52) which is expansion mechanisms, and the booster compressor (53) which is refrigerating compressors. The

branching liquid tube (13) branched from the 1st connection liquid tube (11) is connected to the liquid side of a frozen heat exchanger (51) via the solenoid controlled valve (7h) and the frozen expansion valve (52).

The gas side [of a frozen heat exchanger (51)] and booster compressor's (53)'s suction side is connected by the connection gas pipe (54). The branch gas pipe (16) branched from the low pressure gas pipe (15) is connected to the discharge side of a booster compressor (53). The check valve (7) and the oil separator (55) are provided in the branch gas pipe (16). Between the oil separator (55) and the connection gas pipe (54), the oil return pipe (57) which has a capillary tube (56) is connected.

The booster compressor (53) is carrying out 2 stage compression of the refrigerant with the compressor style (2D) of the 1st line so that the refrigerant evaporation temperature of a frozen heat exchanger (51) may become lower than the refrigerant evaporation temperature of a cold storage heat exchanger (45). The refrigerant evaporation temperature of the frozen heat exchanger (51) is set as -40 **, for example.

A frozen expansion valve (52) is a thermal-sensing type expansion valve, and the temperature sensor barrel is attached to the gas side of a frozen heat exchanger (51). The fin and tube type heat exchanger of a cross fin type can be conveniently used for a frozen heat exchanger (51), for example. The frozen fan (58) which is a cooling fan approaches a frozen heat exchanger (51), and is arranged at it.

Between the lower stream sides of the check valve (7) of the connection gas pipe (54) which is a booster compressor's (53)'s suction side, and the branch gas pipe (16) which is the discharge sides of a booster compressor (53), the by-path pipe (59) which has a check valve (7) is connected. When a booster compressor (53) stops by failure etc., a by-path pipe (59) pours a refrigerant so that a booster compressor (53) may be made to bypass.

- Control system -

Various sensors and various switches are formed in the refrigerant circuit (1E). The high pressure sensor (61) which is a pressure detection means which detects high pressure refrigerant pressure, and the discharge temperature sensor (62) which is the temperature detecting means which detect high pressure refrigerant temperature are formed in the high pressure gas pipe (8) of the outdoor unit (1A). The discharge temperature sensor (63) which is a temperature detecting means which detects high pressure refrigerant temperature is formed in the discharge pipe (5c) of the 2nd inverter compressor (2C). The pressure switch (64) which will operate if high pressure refrigerant pressure becomes beyond a predetermined value is formed in each discharge pipe (5a, 5b, 5c) of a non inverter compressor (2A), the 1st inverter compressor (2B), and the 2nd inverter compressor (2C).

[each induction pipe (6b, 6c) of the 1st inverter compressor (2B) and the 2nd inverter compressor (2C)] The low pressure sensor (65, 66) which is a pressure detection means

which detects low pressure refrigerant pressure, and the suction temperature degree sensor (67, 68) which is the temperature detecting means which detect low pressure refrigerant temperature are formed.

The outdoor heat-exchanger-temperature sensor (69) which is a temperature detecting means which detects the evaporating temperature or condensation temperature which is the refrigerant temperature in an outdoor heat exchanger (4) is formed in the outdoor heat exchanger (4). The air temperature probe (70) which is a temperature detecting means which detects outdoor air temperature is formed in the outdoor unit (1A).

The indoor heat-exchanger-temperature sensor (71) which is a temperature detecting means which detects the condensation temperature or evaporating temperature which is the refrigerant temperature in indoor heat exchanger (41) is formed in indoor heat exchanger (41).

The gas temperature sensor (72) which is a temperature detecting means which detects gas refrigerant temperature is formed in the gas side of indoor heat exchanger (41). The room temperature sensor (73) which is a temperature detecting means which detects indoor air temperature is formed in the indoor unit (1B).

The cold storage temperature sensor (74) which is a temperature detecting means which detects the temperature inside in the showcase for cold storage is formed in the cold storage unit (1C). The freezing temperature sensor (75) which is a temperature detecting means which detects the temperature inside in the showcase for freezing is formed in the refrigerating and heating unit (1D).

The solution temperature sensor (76) which is a temperature detecting means which detects the refrigerant temperature after flowing through a floor-heating heat exchanger (36) is formed in the 2nd piping (38) of the floor-heating circuit (35).

The output signal of various sensors and various switches is inputted into the controller (80). The controller (80) is constituted so that the capacity of the 1st inverter compressor (2B) and the 2nd inverter compressor (2C), etc. may be controlled.

The controller (80) has a failure detection part which detects failure of each compressor (2A, 2B, 2C). Well-known art can be used about the fault detection of a compressor, for example, failure can be detected based on an excess current, discharged refrigerant temperature, etc. of each compressor (2A, 2B, 2C). As long as the abnormalities which limitation in particular does not have about the judgment method of failure, either, for example, coil round a compressor occur at the time of starting in five continuation, it may be made to judge it as failure.

Not only the fault detection of the above-mentioned compressor but the following various operations are performed, and the controller (80) is constituted so that switching control of those operations may also be performed.

- Cooling operation -

Cooling operation is operation which performs only air conditioning of an indoor unit (1B). At

the time of this cooling operation, as shown in drawing 2, a non inverter compressor (2A) constitutes the compressor style (2D) of the 1st line, and the 1st inverter compressor (2B) and the 2nd inverter compressor (2C) constitute the compressor style (2E) of the 2nd line. And only the 1st inverter compressor (2B) and the 2nd inverter compressor (2C) which are the compressor styles (2E) of the 2nd above-mentioned line are driven.

The 1st four way directional control valve (3A) and the 2nd four way directional control valve (3B) switch to the 1st state, respectively, as the continuous line of drawing 2 shows. the [of a communicating vessel (21)] -- the opening of the solenoid controlled valve (7b) of 2 secondary pipes (24) is carried out. the [of a communicating vessel (21)] -- the solenoid controlled valve (7a) of 1 secondary pipe (23), the outdoor expansion valve (26), the solenoid controlled valve (7g) of a cold storage unit (1C), and the solenoid controlled valve (7h) of a refrigerating and heating unit (1D) are closed.

In this state, from the 1st four way directional control valve (3A), the refrigerant breathed out from the 1st inverter compressor (2B) and the 2nd inverter compressor (2C) flows into an outdoor heat exchanger (4) through an outdoor gas pipe (9), and is condensed in an outdoor heat exchanger (4). The condensed liquid cooling intermediation flows through a liquid tube (10), flows through the 2nd connection liquid tube (12) through a receiver (14), expands by an indoor expansion valve (42), and evaporates in indoor heat exchanger (41). the gas refrigerant which evaporated should pass the 1st four way directional control valve (3A) and the 2nd four way directional control valve (3B) from a connection gas pipe (17) -- it flows through the induction pipe (6c) of the 2nd inverter compressor (2C), and returns to the 1st inverter compressor (2B) and the 2nd inverter compressor (2C). Such refrigerant circulation is repeated and air conditioning of the inside of a shop which is the interior of a room is performed.

In this cooling operation, a compressor (2B, 2C) is controlled to be shown in drawing 3. The following two judgments are performed in this control. That is, in step ST11, it is judged whether the conditions 1 that the room temperature Tr which a room temperature sensor (73) detects is higher than the temperature which added 3 ** to the preset temperature Tset are satisfied. In step ST12, it is judged whether the conditions 2 that the room temperature Tr is lower than the preset temperature Tset are satisfied.

And when the conditions 1 of step ST11 are satisfied, it moves to step ST13, and the return of the capability of the 1st inverter compressor (2B) or the 2nd inverter compressor (2C) is improved and carried out. When the conditions 1 of above-mentioned step ST11 are not satisfied but the conditions 2 of step ST12 are satisfied, it moves to step ST14, and the return of the capability of the 1st inverter compressor (2B) or the 2nd inverter compressor (2C) is lowered and carried out. Since it is sufficient by the present compressor capability when the conditions 2 of above-mentioned step ST12 are not satisfied, a return is carried out and above-mentioned operation is repeated.

In main cooling fringe operation, capacity control of the compressor in Steps ST13 and ST14 is performed as follows. Namely. [increase control of the above-mentioned compressor capacity] As shown in drawing 4, after raising one inverter compressor (here, it is considered as the 1st inverter compressor (2B)) in the minimum capacity from a halt condition (refer to A point), this inverter compressor (2B) has been first maintained in the minimum capacity. Other inverter compressors (here the 2nd inverter compressor (2C)) are driven from a halt condition, and capacity is increased. Then, if load increases, the capacity of the 1st inverter compressor (2B) will be increased, maintaining the 2nd inverter compressor (2C) in the maximum capacity (refer to B point). On the other hand, reduction control of compressor capacity is control performed in a procedure contrary to above-mentioned increase control. Below, suppose that the capacity control of the above-mentioned compressor, i.e., capacity control in case both compressors are inverter compressors, is especially called "the 1st capacity control."

Based on the detection temperature of an indoor heat-exchanger-temperature sensor (71) and a gas temperature sensor (72), degree-of-superheat control of the opening of an indoor expansion valve (42) is carried out.

- Cooling operation at the time of compressor failure -

In this refrigerating plant (1), if failure occurs during the above-mentioned cooling operation at either the 1st inverter compressor (2B) or the 2nd inverter compressor (2C), a non inverter compressor (2A) will be driven instead of being the broken compressor, and cooling operation will be continued.

For example, if the 1st inverter compressor (2B) breaks down during said cooling operation, a controller (80) will detect the failure and will stop operation of the compressor (2B) concerned. And the non inverter compressor (2A) which was not being operated is started. That is, a non inverter compressor (2A) is made to operate instead of the broken compressor (2B). As a result, as shown in drawing 5, it circulates through a refrigerant. [that is, the refrigerant breathed out from a non inverter compressor (2A) and the 2nd inverter compressor (2C)] It condenses in an outdoor heat exchanger (4), expands by an indoor expansion valve (42), and evaporates in indoor heat exchanger (41), and circulating movement which returns to a non inverter compressor (2A) and the 2nd inverter compressor (2C) is performed.

In run proper, capacity control of a compressor is performed as follows. That is, as shown in drawing 6, when load is small, where a non inverter compressor (2A) is suspended first, an inverter compressor (run proper the 2nd inverter compressor (2C)) is driven (refer to A point), and capacity is raised. If load increases after this 2nd inverter compressor (2C) goes up in the maximum capacity (refer to B point) and also the 2nd inverter compressor (2C) will be decreased in the minimum capacity at the same time it makes a non inverter compressor (2A) drive (refer to C point). Then, if load increases, the capacity of the 2nd inverter compressor (2C) will be raised. On the other hand, reduction control of compressor capacity is performed

in a procedure contrary to above-mentioned increase control. Below, suppose that the capacity control of the above-mentioned compressor, i.e., capacity control in case one compressor is a non inverter compressor and the compressor of another side is an inverter compressor, is especially called "the 2nd capacity control."

Even if it is a case where the 2nd inverter compressor (2C) breaks down during cooling operation, cooling operation is continuable like the above.

As mentioned above, according to this refrigerating plant (1), even if one set of a compressor breaks down during cooling operation, cooling operation can be continued as it is, without [without it stops cooling operation, and] causing shortage of cooling capacity.

- Refrigerating operation -

Refrigerating operation is operation which performs only cooling of a cold storage unit (1C) and a refrigerating and heating unit (1D). At the time of refrigerating operation, as shown in drawing 7, a non inverter compressor (2A) and the 1st inverter compressor (2B) constitute the compressor style (2D) of the 1st line, and the 2nd inverter compressor (2C) constitutes the compressor style (2E) of the 2nd line. And only the non inverter compressor (2A) and the 1st inverter compressor (2B) which are the compressor styles (2D) of the 1st above-mentioned line are driven, and a booster compressor (53) is driven.

The 1st four way directional control valve (3A) switches to the 1st state, as the continuous line of drawing 7 shows. The opening of the solenoid controlled valve (7g) of a cold storage unit (1C) and the solenoid controlled valve (7h) of a refrigerating and heating unit (1D) is carried out. Two solenoid controlled valves (7a, 7b), outdoor expansion valve (26), and indoor expansion valve (42) of a communicating vessel (21) are closed.

In this state, through an outdoor gas pipe (9), the refrigerant breathed out from a non inverter compressor (2A) and the 1st inverter compressor (2B) flows into an outdoor heat exchanger (4), and condenses from the 1st four way directional control valve (3A). The condensed liquid cooling intermediation flows through a liquid tube (10), it flows through the 1st connection liquid tube (11) through a receiver (14), and a part evaporates in a cold storage heat exchanger (45) through a cold storage expansion valve (46).

On the other hand, other liquid cooling intermediation which flows through the 1st connection liquid tube (11) flows through a branching liquid tube (13), and evaporates in a frozen heat exchanger (51) through a frozen expansion valve (52). The gas refrigerant which evaporated in this frozen heat exchanger (51) is attracted and compressed into a booster compressor (53), and is breathed out by the branch gas pipe (16).

The gas refrigerant which evaporated in the cold storage heat exchanger (45), and the gas refrigerant breathed out from the booster compressor (53) join with a low pressure gas pipe (15), and returns to a non inverter compressor (2A) and the 1st inverter compressor (2B). Such circulating movement is repeated and cooling in the warehouse which are a showcase for cold

storage and a showcase for freezing is performed.
Thus, since the refrigerant which flowed out the frozen heat exchanger (51) is attracted with a booster compressor (53), the refrigerant pressure in a frozen heat exchanger (51) serves as low voltage from the refrigerant pressure in a cold storage heat exchanger (45). As a result, for example, the refrigerant temperature (evaporating temperature) in a frozen heat exchanger (51) will be -40 **, the refrigerant temperature (evaporating temperature) in a cold storage heat exchanger (45) will be -10 **, and cooling will be performed with different cooling temperature.
The compressor capacity at the time of this refrigerating operation is controlled to be shown in drawing 8, and the following two judgments are performed in this control. That is, in step ST21, it is judged whether the conditions 1 that low pressure refrigerant pressure LP which a low pressure sensor (65, 66) detects is higher than 392kPa are satisfied. In step ST22, it is judged whether the conditions 2 that low pressure refrigerant pressure LP is lower than 245kPa are satisfied.
And when the conditions 1 of step ST21 are satisfied, it moves to step ST23, and the return of the capability of the 1st inverter compressor (2B) or a non inverter compressor (2A) is improved and carried out. When the conditions 1 of above-mentioned step ST21 are not satisfied but the conditions 2 of step ST22 are satisfied, it moves to step ST24, and the return of the capability of the 1st inverter compressor (2B) or a non inverter compressor (2A) is lowered and carried out. Since it is sufficient by the present compressor capability when the conditions 2 of step ST22 are not satisfied, a return is carried out and above-mentioned operation is repeated.
In run proper, since a non inverter compressor (2A) and the 1st inverter compressor (2B) operate, the 2nd above-mentioned capacity control is performed in Steps ST23 and ST24 (refer to drawing 6).
About the opening of a cold storage expansion valve (46) and a frozen expansion valve (52), degree-of-superheat control by a temperature sensor barrel is performed. It is the same at each [the following and] operation.
- Refrigerating operation at the time of compressor failure -
if a non inverter compressor (2A) or the 1st inverter compressor (2B) breaks down [this refrigerating plant (1)] during the above-mentioned refrigerating operation, while driving the 2nd inverter compressor (2C) -- the -- the opening of the solenoid controlled valve (7a) of 1 secondary pipe (23) is carried out, and refrigerating operation is continued.
If the 1st inverter compressor (2B) breaks down during said refrigerating operation, a controller (80) will detect the failure and, specifically, will stop operation of the compressor (2B) concerned. And while starting the 2nd inverter compressor (2C) that was not being operated, the opening of the solenoid controlled valve (7a) is carried out. As a result, as shown in drawing 9, it circulates through a refrigerant. [that is, the refrigerant breathed out from a non

inverter compressor (2A) and the 2nd inverter compressor (2C)] It condenses in an outdoor heat exchanger (4), expands by each of a cold storage expansion valve (46) and a frozen expansion valve (52), and evaporates in each of a cold storage heat exchanger (45) and a frozen heat exchanger (51), and circulating movement which returns to a non inverter compressor (2A) and the 2nd inverter compressor (2C) is performed.

The 2nd above-mentioned capacity control is performed about control of a non inverter compressor (2A) and the 2nd inverter compressor (2C) (refer to drawing 6).

On the other hand, if a non inverter compressor (2A) breaks down during said refrigerating operation, a controller (80) will detect the failure and will stop operation of the compressor (2A) concerned. And while starting the 2nd inverter compressor (2C) that was not being operated, the opening of the solenoid controlled valve (7a) is carried out. [in this case the refrigerant breathed out from the 1st inverter compressor (2B) and the 2nd inverter compressor (2C)] It condenses in an outdoor heat exchanger (4), expands by each of a cold storage expansion valve (46) and a frozen expansion valve (52), and evaporates in each of a cold storage heat exchanger (45) and a frozen heat exchanger (51), and circulating movement which returns to the 1st inverter compressor (2B) and the 2nd inverter compressor (2C) is performed.

The 1st above-mentioned capacity control is performed about control of the 1st inverter compressor (2B) and the 2nd inverter compressor (2C) (refer to drawing 4).

Therefore, even if one set of a compressor breaks down during refrigerating operation, refrigerating operation can be continued as it is, without [without it stops refrigerating operation, and] causing shortage of refrigerating capacity.

- Air conditioning refrigerating operation -

Air conditioning refrigerating operation is operation which performs simultaneously cooling of air conditioning of an indoor unit (1B), a cold storage unit (1C), and a refrigerating and heating unit (1D). As shown in drawing 10, a non inverter compressor (2A) and the 1st inverter compressor (2B) constitute the compressor style (2D) of the 1st line, and the 2nd inverter compressor (2C) constitutes the compressor style (2E) of the 2nd line from this air conditioning refrigerating operation. And a non inverter compressor (2A), the 1st inverter compressor (2B), and the 2nd inverter compressor (2C) are driven, and a booster compressor (53) is driven. The 1st four way directional control valve (3A) and the 2nd four way directional control valve (3B) switch to the 1st state, respectively, as the continuous line of drawing 10 shows. The opening of the solenoid controlled valve (7g) of a cold storage unit (1C) and the solenoid controlled valve (7h) of a refrigerating and heating unit (1D) is carried out. Two solenoid controlled valves (7a, 7b) and outdoor expansion valve (26) of a communicating vessel (21) are closed.

In this state, the refrigerant breathed out from a non inverter compressor (2A), the 1st inverter compressor (2B), and the 2nd inverter compressor (2C) joins with a high pressure gas pipe (8),

and is condensed in an outdoor heat exchanger (4) through an outdoor gas pipe (9) from the 1st four way directional control valve (3A). The condensed liquid cooling intermediation flows through a liquid tube (10), and divides and flows into the 1st connection liquid tube (11) and the 2nd connection liquid tube (12) through a receiver (14).

The liquid cooling intermediation which flows through the 2nd connection liquid tube (12) expands by an indoor expansion valve (42), and evaporates in indoor heat exchanger (41). the gas refrigerant which evaporated should pass the 1st four way directional control valve (3A) and the 2nd four way directional control valve (3B) from a connection gas pipe (17) -- it flows through an induction pipe (6c), and returns to the 2nd inverter compressor (2C).

On the other hand, a part of liquid cooling intermediation which flows through the 1st connection liquid tube (11) expands by a cold storage expansion valve (46), and it evaporates in a cold storage heat exchanger (45). Other liquid cooling intermediation which flows through the 1st connection liquid tube (11) flows through a branching liquid tube (13), expands by a frozen expansion valve (52), and evaporates in a frozen heat exchanger (51). The gas refrigerant which evaporated in this frozen heat exchanger (51) is attracted and compressed into a booster compressor (53), and is breathed out by the branch gas pipe (16).

The gas refrigerant which evaporated in the cold storage heat exchanger (45), and the gas refrigerant breathed out from the booster compressor (53) join with a low pressure gas pipe (15), and returns to a non inverter compressor (2A) and the 1st inverter compressor (2B).

Such circulating movement is repeated and cooling in each warehouse which is air conditioning of the inside of a shop which is the interior of a room, a showcase for cold storage, and a showcase for freezing is performed.

Next, the refrigerating cycle at the time of air conditioning refrigerating operation is explained, referring to drawing 11.

The refrigerant inhaled by the 2nd inverter compressor (2C) is compressed to A point. A refrigerant is compressed to B point by the non inverter compressor (2A) and the 1st inverter compressor (2B). The refrigerant of A point and the refrigerant of B point join, are condensed and turn into a refrigerant of C point. Some refrigerants of C point are decompressed to D point by an indoor expansion valve (42), for example, it evaporates at +5 **, and is attracted by the 2nd inverter compressor (2C) at E point.

Some refrigerants of C point describing above are decompressed to F point by a cold storage expansion valve (46), for example, it evaporates at -10 **, and is attracted by a non inverter compressor (2A) and the 1st inverter compressor (2B) at G point.

Some refrigerants of C point describing above are decompressed to H point by a frozen expansion valve (52), for example, it evaporates at -40 **, and is attracted by the booster compressor (53) at I point. The refrigerant compressed to J point with this booster compressor (53) is attracted by a non inverter compressor (2A) and the 1st inverter compressor (2B) at G

point.
Thus, the refrigerant of a refrigerant circuit (1E) is compressed by the compressor style (2D) of the 1st line, the compressor style (2E) of the 2nd line, and a booster compressor (53), and evaporates in a total of three kinds of evaporating temperature.
- Air conditioning refrigerating operation at the time of compressor failure -
if a non inverter compressor (2A) or the 1st inverter compressor (2B) breaks down during the above-mentioned air conditioning refrigerating operation in this refrigerating plant (1) -- the -- the opening of the solenoid controlled valve (7a) of 1 secondary pipe (23) is carried out, and air conditioning refrigerating operation is continued.
For example, if the 1st inverter compressor (2B) breaks down during said air conditioning refrigerating operation, a controller (80) will detect the failure and will stop operation of the compressor (2B) concerned. And the opening of the solenoid controlled valve (7a) is carried out. As a result, as shown in drawing 12, it circulates through a refrigerant.
That is, after condensing and shunting the refrigerant breathed out from a non inverter compressor (2A) and the 2nd inverter compressor (2C) by an outdoor heat exchanger (4), it flows into an indoor unit (1B), a cold storage unit (1C), and a refrigerating and heating unit (1D). Like the time of said air conditioning refrigerating operation, the refrigerant which flowed into the cold storage unit (1C) and the refrigerating and heating unit (1D) expands, respectively by the cold storage expansion valve (46) and a frozen expansion valve (52), and evaporates, respectively in a cold storage heat exchanger (45) and a frozen heat exchanger (51). On the other hand, the refrigerant which flowed into the indoor unit (1B) expands by an indoor expansion valve (42), and evaporates in indoor heat exchanger (41).
since the solenoid controlled valve (7a) is carrying out the opening here -- the non inverter compressor (2A) inhalation-side and 2nd inverter compressor (2C) inhalation-side -- the -- it is open for free passage through 1 secondary pipe (23). Therefore, if it is in run proper, the suction pressure of a non inverter compressor (2A) and the suction pressure of the 2nd inverter compressor (2C) become equal. As a result, unlike air conditioning refrigerating operation when the compressor is not out of order, the refrigerant pressure of indoor heat exchanger (41) becomes equal to the refrigerant pressure of a cold storage heat exchanger (45). Therefore, the refrigerant evaporation temperature of indoor heat exchanger (41) becomes equal to the refrigerant evaporation temperature of a cold storage heat exchanger (45), and the cooling temperature of indoor heat exchanger (41) becomes low compared with compressor failure before.
By failure of the 1st inverter compressor (2B), the number of driver's stands of a compressor decreases from three sets to two sets, and the circulating volume of refrigerant of the whole refrigerant circuit (1E) decreases. However, since the refrigerant evaporation temperature of indoor heat exchanger (41) becomes low if it is in run proper, there is little circulating volume of

refrigerant required in order to maintain the cooling capacity of indoor heat exchanger (41), and it ends. Therefore, air conditioning refrigerating operation can be continued, without reducing each cooling capacity of a cold storage heat exchanger (45) and a frozen heat exchanger (51), and the cooling capacity of indoor heat exchanger (41).

In run proper, control as shown in drawing 13 is performed. That is, first, in step ST51, failure of a non inverter compressor (2A) or the 1st inverter compressor (2B) is judged, when a decision result is YES, it progresses to step ST52, and the opening of the solenoid controlled valve (7a) is carried out. Next, in step ST53, low pressure refrigerant pressure LP>392kPa is judged, and, in YES, the return of the compressor capability is improved and carried out in step ST55. On the other hand, when the decision result of step ST53 is NO, it progresses to step ST54 and it is judged whether it is low pressure refrigerant pressure LP<245kPa. In YES, it progresses step ST56, and the return of the compressor capability is lowered and carried out. When the decision result of step ST54 is NO, a return is carried out as it is.

moreover -- if the 2nd inverter compressor (2C) breaks down during said air conditioning refrigerating operation in this refrigerating plant (1) -- the -- the opening of the solenoid controlled valve (7b) of 2 secondary pipes (24) is carried out suitably, and air conditioning refrigerating operation is continued.

Specifically, control as shown in drawing 14 is performed. That is, first, in step ST31, failure of the 2nd inverter compressor (2C) is judged, and in being YES, it progresses to step ST32. step ST32 -- the -- it is judged whether the solenoid controlled valve (7b) of 2 secondary pipes (24) is carrying out the opening. When the decision result of step ST32 is NO, it progresses to step ST33, and it is judged whether low pressure refrigerant pressure LP is higher than 392kPa. When the decision result of step ST33 is NO, it progresses to step ST34, and it is judged whether low pressure refrigerant pressure LP is lower than 245kPa. A return is carried out when the decision result of step ST34 is NO.

When the decision result of step ST32 is YES, in step ST36, it is judged whether the conditions of room temperature Tr-preset temperature Tset<0 ** are satisfied. As a result, since room temperature is lower than preset temperature in YES, it is judged that there is no necessity for air conditioning, progress to step ST42, and a solenoid controlled valve (7b) is closed, and the return of the indoor expansion valve (42) is closed and carried out. On the other hand, when the decision result of step ST36 is NO, it progresses to step ST37.

In step ST37, it is judged whether the conditions of room temperature Tr-preset temperature Tset>3 ** or low pressure refrigerant pressure LP>392kPa are satisfied. When a decision result is YES, it progresses to step ST38, the capability of a compressor is increased, and a return is carried out. When the decision result of step ST37 is NO, it progresses to step ST39 and it is judged whether compressor capability has satisfied the conditions of the maximum and low pressure refrigerant pressure LP>392kPa. When the decision result of step ST39 is

YES, it progresses to step ST42, and a return is carried out when the decision result of step ST39 is NO.

When the decision result of step ST33 is YES, it progresses to step ST40, and the capability of a compressor is increased, and a return is carried out. When the decision result of step ST34 is YES, it progresses to step ST41, and the opening of the solenoid controlled valve (7b) is carried out, and a return is carried out.

As mentioned above, according to this refrigerating plant (1), even if one set of a compressor breaks down during air conditioning refrigerating operation, air conditioning refrigerating operation can be continued as it is, without [without it stops air conditioning refrigerating operation, and] causing shortage of refrigerating capacity and cooling capacity.

- Heating operation -

Heating operation is operation which performs only heating of an indoor unit (1B) and a floor-heating circuit (35). At the time of this heating operation, as shown in drawing 15, a non inverter compressor (2A) constitutes the compressor style (2D) of the 1st line, and the 1st inverter compressor (2B) and the 2nd inverter compressor (2C) constitute the compressor style (2E) of the 2nd line. And only the 1st inverter compressor (2B) and the 2nd inverter compressor (2C) which are the compressor styles (2E) of the 2nd above-mentioned line are driven.

As the continuous line of drawing 15 shows, the 1st four way directional control valve (3A) switches to the 2nd state, and as the continuous line of drawing 15 shows the 2nd four way directional control valve (3B), it switches to the 1st state. the [of a communicating vessel (21)] -- the opening of the solenoid controlled valve (7b) of 2 secondary pipes (24) is carried out. the [of a communicating vessel (21)] -- the solenoid controlled valve (7a) of 1 secondary pipe (23), the solenoid controlled valve (7g) of a cold storage unit (1C), and the solenoid controlled valve (7h) of a refrigerating and heating unit (1D) are closed.

In this state, the refrigerant breathed out from the 1st inverter compressor (2B) and the 2nd inverter compressor (2C) is condensed in indoor heat exchanger (41) through a connection gas pipe (17) from the 1st four way directional control valve (3A). The condensed liquid cooling intermediation flows through the 2nd connection liquid tube (12), flows through a floor-heating circuit (35), and flows into a receiver (14) through a floor-heating heat exchanger (36). Then, the above-mentioned liquid cooling intermediation evaporates in an outdoor heat exchanger (4) through the outdoor expansion valve (26) of an auxiliary liquid pipe (25). the gas refrigerant which evaporated should pass the 1st four way directional control valve (3A) and the 2nd four way directional control valve (3B) -- it flows through the induction pipe (6c) of the 2nd inverter compressor (2C), and returns to the 1st inverter compressor (2B) and the 2nd inverter compressor (2C). This circulation is repeated and the heating and floor heating of inside of a shop which are the interior of a room are performed.

The capacity of the compressor at the time of heating operation is controlled to be shown in drawing 16. The following two judgments are performed in this control. That is, in step ST61, it is judged whether the conditions 1 of preset temperature Tset-room temperature Tr>3 ** are satisfied. In step ST62, it is judged whether the conditions 2 of preset temperature Tset-room temperature Tr<0 ** are satisfied.

And when the conditions 1 of above-mentioned step ST61 are satisfied, it moves to step ST63, and the return of the capability of the 1st inverter compressor (2B) or the 2nd inverter compressor (2C) is improved and carried out. When the conditions 1 of above-mentioned step ST61 are not satisfied but the conditions 2 of step ST62 are satisfied, it moves to step ST64, and the return of the capability of the 1st inverter compressor (2B) or the 2nd inverter compressor (2C) is lowered and carried out. Since it is sufficient by the present compressor capability when the conditions 2 of above-mentioned step ST62 are not satisfied, a return is carried out and above-mentioned operation is repeated. The 1st above-mentioned capacity control is performed when fluctuating the above-mentioned compressor capacity (refer to drawing 4).

Based on the pressure equivalent saturation temperature and the detection temperature of a suction temperature degree sensor (67, 68) based on a low pressure sensor (65, 66), degree-of-superheat control of the opening of an outdoor expansion valve (26) is carried out. Based on the detection temperature of an indoor heat-exchanger-temperature sensor (71) and a solution temperature sensor (76), supercooling control of the opening of an indoor expansion valve (42) is carried out.

- Heating operation at the time of compressor failure -

In this refrigerating plant (1), if the 1st inverter compressor (2B) or the 2nd inverter compressor (2C) breaks down during the above-mentioned heating operation, a non inverter compressor (2A) will be driven instead of being the broken compressor, and heating operation will be continued.

For example, if the 1st inverter compressor (2B) breaks down during said heating operation, a controller (80) will detect the failure and will stop operation of the compressor (2B) concerned. And the non inverter compressor (2A) which was not being operated is started. As a result, as shown in drawing 17, it circulates through a refrigerant. [that is, the refrigerant breathed out from a non inverter compressor (2A) and the 2nd inverter compressor (2C)] It condenses by indoor heat exchanger (41) and a floor-heating heat exchanger (36), expands by an outdoor expansion valve (26), and evaporates in an outdoor heat exchanger (4), and circulating movement which returns to a non inverter compressor (2A) and the 2nd inverter compressor (2C) is performed.

The 2nd capacity control is performed about the change in the capacity of the compressor in run proper (refer to drawing 6).

Even if it is a case where the 2nd inverter compressor (2C) breaks down, heating operation can be made to continue like the above by making a non inverter compressor (2A) operate instead of the 2nd inverter compressor (2C).
As mentioned above, according to this refrigerating plant (1), even if one set of a compressor breaks down during heating operation, heating operation can be continued as it is, without [without it stops heating operation, and] causing shortage of heating capacity.
- Heating refrigerating operation -
As shown in drawing 18, a non inverter compressor (2A) and the 1st inverter compressor (2B) constitute the compressor style (2D) of the 1st line, and the 2nd inverter compressor (2C) constitutes the compressor style (2E) of the 2nd line from heating refrigerating operation. And the above-mentioned non inverter compressor (2A) and the 1st inverter compressor (2B) are driven, and a booster compressor (53) is driven. The 2nd inverter compressor (2C) of the above has suspended operation.
As the continuous line of drawing 18 shows, the 1st four way directional control valve (3A) switches to the 2nd state, and as the continuous line of drawing 18 shows the 2nd four way directional control valve (3B), it switches to the 2nd state. The opening of the solenoid controlled valve (7g) of a cold storage unit (1C) and the solenoid controlled valve (7h) of a refrigerating and heating unit (1D) is carried out. Two solenoid controlled valves (7a, 7b) and outdoor expansion valve (26) of a communicating vessel (21) are closed.
Some refrigerants breathed out from a non inverter compressor (2A) and the 1st inverter compressor (2B) are condensed in indoor heat exchanger (41). The condensed liquid cooling intermediation flows through a floor-heating circuit (35), and flows into a liquid tube (10) from a floor-heating heat exchanger (36).
on the other hand, other refrigerants breathed out from a non inverter compressor (2A) and the 1st inverter compressor (2B) should pass the 2nd four way directional control valve (3B) and the 1st four way directional control valve (3A) from an auxiliary gas pipe (19) -- it flows through an outdoor gas pipe (9), and condenses in an outdoor heat exchanger (4). This condensed liquid cooling intermediation flows through a liquid tube (10), joins the liquid cooling intermediation from a floor-heating circuit (35), flows into a receiver (14), and flows through the 1st connection liquid tube (11).
A part of liquid cooling intermediation which flows through the 1st connection liquid tube (11) evaporates in a cold storage heat exchanger (45). Other liquid cooling intermediation which flows through the above-mentioned 1st connection liquid tube (11) evaporates in a frozen heat exchanger (51). The gas refrigerant which evaporated in the cold storage heat exchanger (45), and the gas refrigerant breathed out from the booster compressor (53) join with a low pressure gas pipe (15), and returns to a non inverter compressor (2A) and the 1st inverter compressor (2B). Cooling in the warehouse which are a showcase for cold storage and a showcase for

freezing is performed at the same time such circulating movement is repeated and the heating and floor heating of inside of a shop which are the interior of a room are performed.
The compressor capacity and outdoor fan (4F) air capacity at the time of this heating refrigerating operation are controlled to be shown in drawing 19, and the following four judgments are made.
That is, in step ST81, it is judged whether the conditions 1 of preset temperature Tset-room temperature Tr>3 ** and low pressure refrigerant pressure LP>392kPa are satisfied. In step ST82, it is judged whether the conditions 2 of preset temperature Tset-room temperature Tr>3 ** and low pressure refrigerant pressure LP<245kPa are satisfied. In step ST83, it is judged whether the conditions 3 of 0 ** and preset temperature Tset-room temperature Tr<low pressure refrigerant pressure LP>392kPa are satisfied. In step ST84, it is judged whether the conditions 4 of preset temperature Tset-room temperature Tr<0 ** and low pressure refrigerant pressure LP<245kPa are satisfied.
And when the conditions 1 of above-mentioned step ST81 are satisfied, it moves to step ST85, and the return of the capability of the 1st inverter compressor (2B) or a non inverter compressor (2A) is improved and carried out. When the conditions 1 of above-mentioned step ST81 are not satisfied but the conditions 2 of step ST82 are satisfied, it moves to step ST86, and the air capacity of an outdoor fan (4F) is reduced, and a return is carried out. That is, since heating capacity is liable to insufficient, the amount of heat of condensation of an outdoor heat exchanger (4) is given to indoor heat exchanger (41). When the conditions 2 of above-mentioned step ST82 are not satisfied but the conditions 3 of step ST83 are satisfied, it moves to step ST87, and the air capacity of an outdoor fan (4F) is raised, and a return is carried out. That is, since heating capacity is feeling not much, the amount of heat of condensation of indoor heat exchanger (41) is given to an outdoor heat exchanger (4). When the conditions 3 of above-mentioned step ST83 are not satisfied but the conditions 4 of step ST84 are satisfied, it moves to step ST88, and the return of the capability of the 1st inverter compressor (2B) or a non inverter compressor (2A) is lowered and carried out. Since it is sufficient by the present compressor capability when the conditions 4 of above-mentioned step ST84 are not satisfied, a return is carried out and above-mentioned operation is repeated. The increase and decrease of control of the above-mentioned compressor capacity are performed based on the 2nd capacity control (refer to drawing 6).
- Heating refrigerating operation at the time of compressor failure -
If a non inverter compressor (2A) or the 1st inverter compressor (2B) breaks down [this refrigerating plant (1)] during the above-mentioned heating refrigerating operation, while driving the 2nd inverter compressor (2C) instead of being the broken compressor, the -- the opening of the solenoid controlled valve (7a) of 1 secondary pipe (23) is carried out, and heating refrigerating operation is continued.

For example, if the 1st inverter compressor (2B) breaks down during said heating refrigerating operation, a controller (80) will detect the failure and will stop operation of the compressor (2B) concerned. And while starting the 2nd inverter compressor (2C) that was not being operated, the opening of the solenoid controlled valve (7a) is carried out. As a result, as shown in drawing 20, it circulates through a refrigerant. That is, some refrigerants breathed out from a non inverter compressor (2A) and the 2nd inverter compressor (2C) are condensed by indoor heat exchanger (41) and a floor-heating heat exchanger (36). On the other hand, other refrigerants breathed out from a non inverter compressor (2A) and the 2nd inverter compressor (2C) are condensed in an outdoor heat exchanger (4), join the refrigerant from a floor-heating heat exchanger (36), and flow into a receiver (14). A receiver's (14)'s refrigerant evaporates, respectively in a cold storage heat exchanger (45) and a frozen heat exchanger (51), and returns to a non inverter compressor (2A) and the 2nd inverter compressor (2C). Capacity control of a non inverter compressor (2A) and the 2nd inverter compressor (2C) is performed based on the 2nd capacity control (refer to drawing 6).

Even if it is a case where a non inverter compressor (2A) breaks down, heating refrigerating operation can be made to continue like the above by making the 2nd inverter compressor (2C) operate instead of a non inverter compressor (2A).

As mentioned above, according to this refrigerating plant (1), even if one set of a compressor breaks down during heating refrigerating operation, heating refrigerating operation can be continued as it is, without [without it stops heating refrigerating operation, and] causing shortage of heating capacity and refrigerating capacity.

- Other embodiments -

The refrigerating plant concerning this invention is not limited to the thing provided with three sets of compressors, but may be provided with four or more sets of compressors.

["the 1st compressor", the "2nd compressor", and the "3rd compressor" which are said by this invention] The non inverter compressor (2A) of said embodiment, the 1st inverter compressor (2B), Although it corresponds to the 2nd inverter compressor (2C), respectively, it may have a different correspondence relation so that a non inverter compressor (2A) or the 2nd inverter compressor (2C) may be equivalent to the "2nd compressor" of this invention. That is, those correspondence relations in particular are not limited.

Industrial applicability

As mentioned above, this invention is useful to the refrigerating plant which can perform air conditioning and freezing freely.

[Brief Description of the Drawings]

Drawing 1 is a refrigerant circuit figure of a refrigerating plant.

Drawing 2 is a refrigerant circuit figure showing the refrigerant circulation of cooling operation.

Drawing 3 is a control flow chart of cooling operation.

Drawing 4 is a figure for explaining the 1st capacity control.
Drawing 5 is a refrigerant circuit figure showing the refrigerant circulation of the cooling operation at the time of compressor failure.
Drawing 6 is a figure for explaining the 2nd capacity control.
Drawing 7 is a refrigerant circuit figure showing the refrigerant circulation of refrigerating operation.
Drawing 8 is a control flow chart of refrigerating operation.
Drawing 9 is a refrigerant circuit figure showing the refrigerant circulation of the refrigerating operation at the time of compressor failure.
Drawing 10 is a refrigerant circuit figure showing the refrigerant circulation of air conditioning refrigerating operation.
Drawing 11 is a Mollier diagram explaining a refrigerating cycle.
Drawing 12 is a refrigerant circuit figure showing the refrigerant circulation of the air conditioning refrigerating operation at the time of compressor failure.
Drawing 13 is a control flow chart of the air conditioning refrigerating operation at the time of compressor failure.
Drawing 14 is a control flow chart of the air conditioning refrigerating operation at the time of compressor failure.
Drawing 15 is a refrigerant circuit figure showing the refrigerant circulation of heating operation.
Drawing 16 is a control flow chart of heating operation.
Drawing 17 is a refrigerant circuit figure showing the refrigerant circulation of the heating operation at the time of compressor failure.
Drawing 18 is a refrigerant circuit figure showing the refrigerant circulation of heating refrigerating operation.
Drawing 19 is a control flow chart of heating refrigerating operation.
Drawing 20 is a refrigerant circuit figure showing the refrigerant circulation of the heating refrigerating operation at the time of compressor failure.

[Translation done.]